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The Council of Ironfoundry Associations
The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The Welsh Engineers' and Founders' Association
The Foundry Trades' Equipment and Supplies Association

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The Institutes Carry On

In the days of King Charles, informal discussion of scientific problems rather than prepared lectures was the rule. Then with the passage of time, the formal presentation of Papers became general, because it was desirable to make a permanent record for the wider dissemination of scientific knowledge. Moreover, argument had to be reinforced by masses of figures and illustration. Nothing—not even the invention and practice of shorthand writing—will permanently replace this time-endorsed system. At the moment, the output of technical Papers is restricted to a very limited extent by censorship and more generally by the fact that those best qualified and accustomed to prepare Papers are overworked. There are cases, such as is exemplified by one of our regular contributors who utilises his periods as fire-watcher to prepare articles. Others just possess exceptional energy.

This general dearth being accepted as a condition of the time, it is of more than passing interest to consider some of the excellent schemes that have been evolved by the technical institutes throughout the civilised world to provide their members with the latest notions and progress registered by the industries they serve. A commendable method was launched by the American Iron and Steel Institute at its New York meeting, where a series of outstanding questions were posed and answered by the acknowledged leaders of thought in each particular field. A typical one selected at random was, "What improvements in quality and production of steel have been made since World War I?" Mr. Stewart J. Cort provided the answer, but restricted his survey to open-hearth practice. A second related to the reduction of manganese content in open-hearth steel without detriment to quality. The West Riding of Yorkshire Branch of the Institute of British Foundrymen has developed a novel and essentially useful scheme for disseminating useful knowledge, whilst at the same time maintaining continuous interest in its work throughout the whole session. The method has been to prepare a drawing of an imaginary cored casting and to devote each meeting to the study of a distinct phase of manufacture or quality control in the dual light of a one-off job and a repetition order. Moreover, the opening of the discussions has, in most cases, been left in the hands of the younger members.

Another interesting innovation made by the Southern Section of The Institute of Vitreous Enamellers is to make a systematic examination of the raw materials of the industry, studying such subjects as distribution, availability, purity, physical properties and uses. A start has been made with felspar, and on its completion it is hoped that a monograph, bringing the subject right up to date, will be published. Furthermore, the Literary and Awards Committee of the Institute of British Foundrymen, through the generosity of the President, Major Miles, is organising a competition with the object of ascertaining what lies before the industry in the future. This involves no great sacrifice of time, as thought can be given to it whilst travelling to and from work; on fire-watching duty, and even when shaving! The actual conversion to writing, once thoughts are marshalled, is quickly done. It is of vital importance that the technical institutes be maintained in "fighting trim," as there is every reason to believe that the Governments of the industrialised countries of the world intend to utilise the services and resources to help them plan and carry out their economic policies at the earliest possible moment. If any interpretation at all could be placed upon the deliberations of the recent "Science and World Order" conference he'd in London, it was that the future would see much closer collaboration between the scientific and technical institutes and the legislature. Thus it behoves every member to support to the maximum of his ability the efforts that are being made to continue the smooth working and increase the usefulness of his appropriate technical institute. These temporary and somewhat novel methods, which we have outlined, are probably as a wartime measure, superior to precedent, and warrant a full measure of support.

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Dolomite Bricks

DR. T. SWINDEN and DR. J. H. CHESTERS, in a communication from the Central Research Department, the United Steel Companies, Limited, Stocksbridge, near Sheffield, made to the Iron and Steel Institute for presentation to the autumn meeting, on the subject of dolomite bricks for use in steelworks, have drawn the following conclusions:—

(1) The further replacement of magnesite and chrome-magnesite bricks in open-hearth and reheating furnaces by dolomite bricks would reduce the strain on shipping and leave home-produced magnesite available for positions in which its use is at present essential.

(2) Dolomite, even after high-temperature calcination or electrical fusion, "perishes" fairly rapidly, owing to hydration of the free lime. It can be rendered stable by firing it in a rotary kiln with a suitable admixture of serpentine and dicalcium-silicate stabilisers.

(3) Bricks made from such clinker consist essentially of magnesia and tricalcium silicate ($3CaO.SiO_2$). They should not contain free lime, but may contain some stabilised β dicalcium silicate.

(4) Given adequate control of the clinker and brick production, such dolomite bricks compare favourably in properties with magnesite bricks, although they have a somewhat lower resistance to spalling and to slags high in iron oxide.

(5) They have been used for many years with complete success in the tap-holes, hearths and banks of fixed open-hearth furnaces, and in the banks and top layers of the sub-hearth of tilting furnaces. They have also given good service in reheating furnaces operating at temperatures at which scale formation is considerable.

(6) Semi-stable dolomite bricks, *i.e.*, dolomite bricks in which the lime is protected from hydration by a coating of flux, have a higher thermal shock and slag resistance, and have given a life equal to that obtained with chrome-magnesite bricks in fixed-furnace back walls.

(7) Limited success has also been obtained in exposed positions with stabilised dolomite bricks in which the intermediate fraction was replaced by magnesia.

(8) Magnesite-stabilised dolomite (80/20) bricks have given encouraging results in preliminary trials in tilting-furnace back walls.

Institute of British Foundrymen

NEW MEMBERS

At a meeting of the Council of the Institute of British Foundrymen, held at the Queen's Hotel, Leeds, on October 18, the following were elected to the various grades of membership:—

As Members

Mr. S. Andersen, director; Mr. H. F. Bryant, managing director; Mr. C. W. Coleman, managing director; Mr. E. Gyles, assistant managing director; Mr. C. Hartman, technical director; Mr. D. Leishman, works manager (iron foundry); Mr. R. Long-Leather, director; Mr. J. A. Williams, representative for Jas. Dougall & Sons, Limited; Mr. J. Wood, M.Sc., metallurgist; Mr. K. Docksey, metallurgist.

Mr. A. J. L. Wallace, M.A., National Trade Association Secretary; Mr. J. Holland, foundry and works manager; Mr. G. T. Morris, representative.

As Associate Members

Mr. D. Anderson, company secretary; Mr. D. Colbridge, foundry planning engineer; Mr. G. Ibbotson, steel moulder.

Mr. A. R. Allsop, wood pattern maker; Mr. K. Bowd, metallurgical laboratory assistant; Mr. E. Bowen, (engineer) draughtsman; Mr. J. H. Dolphin, jig and tool draughtsman; Mr. A. N. Gilchrist, radiologist; Mr. S. G. T. Greenfield, lecturer in engineering; Mr. H. Jackson, draughtsman; Mr. W. Kitching, progress clerk.

Mr. J. E. Bailey, foreman steel moulder; Mr. R. Barker, foreman; Mr. R. T. Grant, moulder; Mr. S. S. Hunt, foreman moulder; Mr. S. B. Sayer, journeyman moulder; Mr. J. L. Stevens, assistant chief castings inspector; Mr. D. W. Taylor, foreman pattern maker; Mr. N. Watts, moulder.

Mr. C. R. McLaine, assistant steel foundry metallurgist; Mr. W. A. Newbold, foreman moulder; Mr. P. Pridgeon, journeyman moulder; Mr. A. E. Probst, foundry manager; Mr. A. Read, foreman moulder; Mr. T. Sutcliffe, iron moulder; Mr. R. M. Turnbull, assistant steel foundry metallurgist; Mr. W. Valentine, coremaker; Mr. J. P. Welsh, analytical chemist.

As Associates

Mr. D. H. Woolley, laboratory assistant; Mr. T. Sutton, iron moulder.

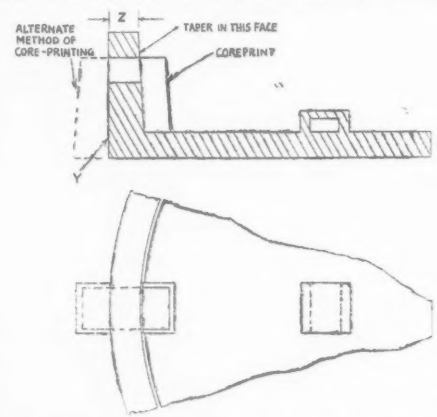
Correspondence

[*We accept no responsibility for the statements made or the opinions expressed by our correspondents.*]

CORE PRINTS

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—It would appear that in making the casting dealt with in his article XXVIII, "Tramp" has made unnecessary work by using a large core with inverse cores for the holes in the metal Z. Taking into account the reference to taper on face Y, and the fact that this face is apparently required to be square to the underside, and assuming that taper is permissible on the inside face, I see no reason why this job should not be made quite easily without resort to a large core on the outside face. Taper on the inside face only should be sufficient to allow easy withdrawal of the pattern from the sand. Core prints could either be on the outside as shown in "Tramp's" sketch or on the



inside as shown in my sketch. Taper in the face of the core prints would be helpful. "Tramp" does not show taper in his large core print. I assume that he would not use a pattern without ample taper in the faces bounded by D D D D, neither does he show the method of construction he would use for the large corebox. This latter item is important as the making of a corebox can quite easily add much to the cost of a job required to be made as cheaply as possible.

It would be helpful if "Tramp" in future articles denoted the top side of the mould. In conclusion I would like to add how much I appreciate "Tramp's" regular contributions to the Journal and trust I shall have the pleasure of reading more in the future.—Yours, etc.,

W. WEARING, JUN.

24, Dorsett Road,
Darlaston, Staffs.
October 9, 1941.

Random Shots

A personality of the foundry industry who will be sadly missed is Mr. Bartlett, especially amongst the members of the London Branch of the Institute of British Foundrymen, of which he was a popular and enthusiastic member. Just how enthusiastic he was in attending meetings of the Branch can be judged by the fact that it was his regular practice, along with Mr. Pierce and Mr. Slater, who also lived in the same inaccessible part of London, to travel home in the driver's cab of a light engine which used to run late at night to Woolwich.

* * *

One cannot help feeling that the choice of Mr. Makemson as Director for Iron Castings is singularly apt, for foundrymen have already grown accustomed to looking upon him as Staff Captain, with Deansgate as G.H.Q. Even when there has been a mass invasion of the various industrial cities of Europe, they have depended on Mr. Makemson to make the invasion plans, and to lead the troops. On these occasions he usually managed to carry out the duties of Field - Marshal, Quartermaster - Sergeant and Diplomatic Relations Officer, all at the same time. He never was an ordinary Tommy!

* * *

A new ghost is stalking the country. Frequent reports come in from all districts that people, on taking one glance at it, have been "completely knocked back." Men are afraid to mention it by name. They just look at the wife when she suggests going to a theatre for a change, and say, "But look at IT!" and immediately they both pale and tremble. They have seen the ghost. Socially-inclined men, enjoying half a pint at the local, stop in the midst of ordering "The same again, please." IT has cast its dismal shadow across the bar. Women, coveting a saucy new hat (unrationed) at twenty-nine and sixpence, hastily multiply it by two and decide that, at the price, it's not worth it! They've seen IT again, and IT demands ten shillings in the pound of every man's money.

* * *

It is quite true to say, however, that the words "income tax" have become just another synonym for money, a word which already abounds in alternatives. "Wealth" and "brass" are relics of a more affluent period. "Wherewithal," "doings," and "spondulicks" were the names frequently adopted by the careless but moneyed young. "Cash," "ready," and "necessary" seem to indicate that their users were hard-headed, practical men knowing the meaning of the phrase "money talks." Then there are two other synonyms, the origin of which is an interesting study. "Oof," for instance, is of Yiddish origin, coming through the German phrase, "Auf dem Tische," which means "on the table," money being understood. "Pelf," on the other hand, comes from an Old French source, "pelfre," which means "spoil or booty." Thus the true use of this synonym implies money acquired somewhat shadily: "filthy lucre," in fact, for the word "pelf" is not much used nowadays. A new era has been ushered in by Damon Runyon, who has provided many synonyms for the "root of all evil," of which the most appropriate seems to be "potatoes."

"MARKSMAN."

Notes from the Branches

Lancashire Branch.—A meeting of the Lancashire Branch of the Institute of British Foundrymen will be held at the Engineers' Club, Albert Square, Manchester, on Saturday, November 1, at 3 p.m., when Mr. J. R. Walker, M.A., F.I.C., will read his Paper, "Heat-Treatment Furnaces and Their Fuels."

Recent Foundry Developments Reviewed

General Survey of Current Trends in Foundry Practice by MR. V. C. FAULKNER before the London Branch of the Institute of British Foundrymen

Members of the London Branch of the Institute met at the National Liberal Club, Whitehall Place, London, S.W.1, on Saturday afternoon, October 4, 1941, to hear Mr. V. C. Faulkner (Past-President of the Institute and of the Branch) open a discussion on modern trends and developments in foundry practice, including both ferrous and non-ferrous subjects.

MR. R. B. TEMPLETON (Branch-President) presided. The minutes of the preceding meeting of the Branch were taken as read, and were confirmed and signed.

MR. FAULKNER (who is now Branch-Secretary) welcomed to the meeting Mr. Daglish, who was honorary secretary of the Branch before the war, but had had to relinquish that office by reason of his services with H.M. Forces. Mr. Daglish had returned home, and had promised to assist with the secretarial work; that assistance would be highly valued, particularly towards the end of the year, when the accounts had to be prepared for auditing, and in connection with some social functions which the Branch-President and Mr. Barrington Hooper were contemplating.

The BRANCH-PRESIDENT endorsed Mr. Faulkner's remarks, and assured Mr. Daglish that the members of the Branch were glad to welcome him back. Inviting Mr. Faulkner to address the meeting, he said the fact that he was able and willing to open a discussion on a wide subject, in spite of his many duties, was evidence of his resilience. The Branch was grateful to him. Incidentally, the Branch-President mentioned that the Council of Ironfoundry Associations had officially appointed the "Foundry Trade Journal" as its official organ. That was a very great compliment, and there was no doubt that Mr. Faulkner, who graced the Editorial Chair, would do the Council justice.

MR. FAULKNER commented that the appointment of the "Foundry Trade Journal" as the official organ of the Council of Ironfoundry Associations coincided with the twenty-first anniversary of his occupancy of the Editorial Chair of the journal, and he hoped it would be a milestone in the collaboration between the employers' federations. In the Council there were representatives of nearly all the employers' federations; it included the British Cast Iron Research Association, the Institute of British Foundrymen and the Engineering Employers' Federation as Associate Members with full voting powers. He was very happy to note also that Dr. J. E. Hirst (a Past-President of the Institute of British Foundrymen and a previous occupant of the Editorial Chair of the "Foundry Trade Journal") was a member of the Executive Committee of the Council, and he hoped for great things from the new "Federation of federations."

MODERN TRENDS AND DEVELOPMENTS IN FOUNDRY PRACTICE

Introducing the subject for discussion, Mr. Faulkner appropriately commenced with a reference to sand. The position with regard to it, he said, was very curious, because hundreds of thousands of pounds had been spent in developing the testing of sand, and the benefits which the foundry industry had derived from that expenditure represented many millions of pounds. The foundries throughout the world had gone a stage further and some had asked the quarry owners to supply sand to certain specifications. Immediately the suppliers had found that the position of sand testing was chaotic and that the results were not reproducible as between one foundry and another. It was necessary to commence sand testing *de novo* and to rebuild on a purely scientific, rather than an empirical, basis.

The American Foundrymen's Association had initiated a five-year programme of research on sand, and had decided to carry out tests at high temperature. At once they had experienced difficulty, however, because it was found that test-pieces of, say, 1½ in. dia. and those of 2 in. dia. gave entirely different results, so that the work on the testing of sands had had to be restarted. He was pleased to be able to say that the objections to the present tests had originated in this country, from the work of Walker, in Sheffield, and Buchanan, in Scotland. He believed that more would be heard of Buchanan's work in the future; Buchanan was a lone worker, and cognisance would be taken of his work in the future.

Quoting from a Paper on the testing of foundry sands and its co-ordination with moulding results, he said that the manner in which the sand was used could have decided influence on economy. Although good foundrymen could obtain good results with almost any kind of sand, they could get better results with controlled sands. After pointing out that dust and dirt should not be allowed to accumulate on testing equipment, he said there was still a big tonnage of good sand going into the refuse dumps at many foundries, and that much of it could be salvaged. In many instances the sands that were scrapped were better than some of the new sands that were being used in the foundries concerned.

To emphasise that tests were still not reproducible, Mr. Faulkner gave the results of miscellaneous tests on four samples by thirteen laboratories. In the moisture test there was a mean variation of 8 per cent.; in the permeability test the variation was 24 per cent.; in respect of green strength, there was a variation of 16 per cent. on the shear and 13 per cent. on compression; and in respect of the dry strength the variation was 29 per cent. on the shear and 23 per cent. on the compression.

When investigating Ford's methods some time ago, he had not quite liked their practice of referring to shear strength as "the break" and to permeability as "the bond." He had since become convinced, however, that those latter terms were better than the more scientific ones. Results which had become available were enabling the founders of magnesium alloys to use the naturally bonded sands, with some knowledge of their properties, instead of the synthetic sands which they had used hitherto.

With regard to pig-iron, he said the machine-cast pig-iron which had come into vogue during recent years had been accepted and approved in every particular except, perhaps, one, and that was that there was difficulty in stacking the pigs, so that there was liability to accidents as the result of the pigs slipping one over the other and falling. He suggested, therefore, that it might be possible to re-design the machine-cast pig-iron in such a way that, whilst retaining ease of casting, the pigs would be of such a shape that they would not slip over each other and constitute a danger when stacked.

Cupola Practice

A most important development in regard to cupola practice, he continued, was that the Americans were initiating a five-year plan, at considerable cost, to get down to the basic facts. One of their first tasks was to study the results of the theoretical work carried out on the Continent and to boil them down into readable and understandable form. From his experience of Continental cupola practice he was convinced that none of the research work, starting with that of Busek, in Poland, and including that carried out at the Kaiser Wilhelm Research Institute, had ever found practical application in the actual foundries; in the course of his visits to the Continent he had found that the founders there did not work their cupolas any better than did the British, nor was scientific control any more evident.

A definite tendency was expressing itself in cupola practice throughout the world to dispense with fans and to adopt direct blowers, and he believed the reason for it, which was fairly obvious, was that blowers gave a definite amount of air with each revolution, whereas the amount of air passing through from a fan varied with the resistance imposed upon it in the actual cupola.

Another feature of cupola practice was the use of the hot blast, and he felt sure that some system of hot blast would come into use in this country. The Germans had tried to introduce it here, but had failed miserably, for an obvious reason. On the other hand, it had been introduced into America, and there it had been a success. The obvious difference between British and American practice was that the American foundries were melting extraordinarily large quantities of iron, in particularly long runs. Those two factors, the long runs and the heavy blow, enabled the regenerators to become properly hot and to function efficiently for a reasonable length of time. The British cupola installations, on the other hand, were smaller, and there was not sufficient heat available to heat the regenerators to the point at which they became efficient before it was time to shut down the blow.

But, having established that there was a relationship between the mass of refractory material to be heated up and, later on, to give the reverse action and heat up the charge, and that that mass must be reduced to a minimum, there were developments in Lancashire which promised to be very successful. The amount of material which would be heated to give the hot blast would be a minimum, because he believed it was actually embedded in the lining of the furnace.

Reclamation of Swarf

The problem of the reclamation of swarf was of great interest at the moment. Apparently the most successful method for the foundry, by and large, was to utilise the residual heat in the cupola after the day's work and to put through one or two casts, and to put them down on the floor. Another method, however, which had given rise to some interest had been developed by the very versatile Buchanan, of Scotland. That method was to pour liquid cupola metal on to turnings and to rotate them in order to give a nice meltable mixture of iron and turnings. Mr. Faulkner said that that method appealed to him as being a good one, because the melting of turnings and borings, especially of cast iron, was difficult; fundamentally there was no flux for graphite if it got in the way and, moreover, the graphite was a refractory, and in many conditions would form a refractory wall to prevent the heat reaching the balance of the mass of metal still to be melted. During the last war a foundry on the Swiss frontier had converted steel turnings into pig-iron by a method which, though crude, was very efficient. A simple cylindrical furnace, lined with refractory, was charged with a mixture of coke, ferro-silicon and steel turnings; the electrode used was suspended from a roughly constructed arm, and periodically a synthetic iron was tapped from the bottom of the furnace. The minimum of labour was involved, and the furnace had no roof; the costs of current and of transporting the turnings to the site, and so on, had to be

Recent Foundry Developments

met, of course, but the overhead charges were really negligible and the installation was very successful.

While on the subject of reclamation, Mr. Faulkner commented that more and more foundries were giving attention to salvage from the rubbish which ordinarily was discarded; a fair number of magnetic separators had been installed and the rubbish leaving the foundries had to pass through them so that the ferrous material contained therein could be reclaimed. Apart from anything else, such plant could be useful as handling apparatus. Mr. Harley, of the Daimler Company, had used his first conveyor to carry rubbish out of the foundry, which was a good idea.

Ladle Metallurgy

Spout and ladle metallurgy was a development which has made great progress in recent times. Mr. Faulkner recalled that, just before he had become an Editor, he had worked with Lord Chetwynd, whose recipe for improving steel was to place, say, 60 tons of liquid steel on a special stand, to drop an electrode into it, treat with sufficient current to melt half a ton of steel, for twenty minutes and thereby reduce the non-metallic inclusions. That process did not meet with much success, but in recent times he had seen a good deal of ladle metallurgy in the iron foundry industry, involving the use of briquettes. Those briquettes were so compounded that they carried heat-giving elements, so that, although one was adding material to the ladle, the contents were not being cooled down. That had been a very worth-while development. When he was in Sheffield, it had been a practice to melt together 25 per cent. of high-speed alloy and 75 per cent. of Swedish bar iron, and so to produce a perfectly good high-speed steel. Metallurgists had sneered at that practice of "steelmaking made easy" simply because, apparently, one eliminated a little elementary arithmetic. To sneer was to give way to metallurgical snobbery; if one could make high-speed steel by such simple methods, one had more time to devote attention to things that mattered for the future. The Meehanite process had made astounding progress throughout the world, and its development, together with the great efforts put forward by the nickel interests, had placed a new weapon in the hands of the foundry industry; that weapon should be used to the greater benefit of the industry in the future.

The Revival of the Bessemer Process and Mechanisation

Another important development in the steel foundry industry was the revival of the Bessemer process. Processes introduced during the last twenty or thirty years had assumed that steel scrap was abundant and was cheaper than pig-iron, and the Bessemer process was the best single process which made scrap and did not consume it. The development of the Bessemer process, which was being placed on a better scientific basis, because of the application of the electric eye, would commence a new era in steelmaking.

Coming to foundry mechanisation, Mr. Faulkner drew a word-picture of a modern mechanised foundry, and another of an older, but equally efficient, establishment. The modern foundry was provided with one or two knock-outs, which effectively separated the sand, the casting and the boxes, the last being returned by conveyor to the moulding station. The sand, after passing through a series of processes, was reconditioned and taken back to the moulders by filling their containers over the machines. Also, at the knock-outs the castings were separated and taken to the fettling shop. In the older establishments, such as were to be found in Yorkshire and Lancashire, the floor was covered with hinged boxes, usually specially designed; the moulders used near-by sand and carried the pattern from mould to mould. That process was perhaps expensive in the provision of boxes; but that was not everything.

Nowadays, one could see the development of a further stage, involving the merging of the two systems; in the modern aluminium foundry one could appreciate how the best features of the two systems were being combined. The castings were made on machines supplied with sand from overhead. The average aluminium casting carried vast quantities of chills, and to send them to a central knock-out station would complicate the problem of getting the chills back. Therefore, the practice was, not to have one casting station, but to take the metal to near the machines, cast up the boxes on site, knock-out, and then to load the sand and castings on to a double conveyor. The surface of the upper conveyor was a grating, and carried the castings to the fettling shop. The lower conveyor carried the sand back for re-preparation. That system was an improvement on what was considered to be a standard mechanised foundry.

In a very good system which had been developed in foundries doing heavy work, advantage was taken of the Sandslinger, which ran along the side wall of the foundry and was supplied with sand from an overhead conveyor. The moulds were made on the floor and cast up at the points at which they were made. When the sand was knocked out it was placed on a grating, beneath which there was a conveyor which carried it back for re-preparation, whence it was brought back to feed the Sandslinger.

Silicon Bronze

Another important wartime development was the utilisation of silicon bronze instead of gunmetal. The analysis was: Si, 1.4 to 4.0; Fe, 0.5 to 3.0; Zn, 4.0 maximum; Mn, 1.5; P, 0.2 maximum; Cu, balance. That product, developed at Vickers and known as P.M.V., had been specified by the Admiralty, the R.A.F. and the U.S. Navy and other authorities. From America it was stated that its general mechanical properties were equal to, if not superior to, gunmetal; its bearing properties were equal to those of gunmetal; its acid-resisting properties were better, and in respect of cavitation it was alleged to be superior. During the session Dr. Pell Walpole would discuss gunmetal, for he had been making researches which showed that gunmetal could still hold up its head, in spite of the inroads which were being made into its sphere by silicon bronzes.

Other Developments

Discussing the fairly general use of water-gas producers as alternative source of power, Mr. Faulkner pointed out that they were all mechanically fed, and their great advantage was their balanced output. The greater the quantity of gas used, the greater the quantity made, so that the production was regulated by the consumption in the works.

A curious and unexpected development in foundries producing pressure die castings was that they had had to put down machine shops. The buyers of such castings expected them to be finished articles, and the foundries producing the castings were installing machine shops to ensure that the castings would do their job properly.

An important development was the Eaton-Erb process of permanent mould casting. In that connection Mr. Faulkner recalled that some years ago Mr. D. Sharpe, of Scotland, had lectured on the Holley carburettor process, and had shown by means of a cinema film the use of turntables, such as those incorporated in the Owens glass bottle machine. Castings were made in permanent moulds on a turntable. As it revolved, the moulds opened and automatically ejected the castings, and the moulds were sprayed with a refractory material. It was a very good method of producing simple-shaped castings, and the castings were produced at an exceedingly fast rate, say, nine seconds for each casting. He understood that in Russia there were no less than eight of the Eaton-Erb machines in operation, and they were also used to a large extent for making motor vehicle castings at Detroit, U.S.A.

The Hydro-Blast System

Another very interesting development which had not yet reached this country was that of the hydraulic cleaning of castings, known as the Hydro-blast system. Probably a dozen plants were in operation. The system was a combination of sand and water blast, and by that means one could get through about an inch of steel within a few minutes. The users actually warmed the water in order that the operatives should not be chilled by cold water around them; there was a quantity of "mud" about, and the operators wore overalls which somewhat resembled divers' suits. Their vizors were cleaned every few seconds. Rust inhibitors were added to the water. The sand in the system was reclaimed, but the water was wasted. He would have thought that the water would have been reclaimed, but the engineers concerned had said that it was a very difficult problem and that such reclamation would probably cost more than it was worth. However, he forecast that within five years after the end of the war there would be 30 major installations of that plant in Europe.

A new phase in the development of testing apparatus for castings was indicated by a case he had seen recently in Mr. Templeton's foundry. A certain casting was being made there, and an old casting was provided as a pattern. It was very difficult to find out the wall thicknesses that were originally standardised even after sawing the casting. An apparatus was now available to measure the wall thicknesses electrically. The method was essentially to compare the resistance in the metal wall under test with that of a similar shaped wall of the same material, of which the thickness was known. A knowledge of the specific resistance of the material was not required. The current, of less than 10 amps., was supplied from a 6-volt or 12-volt battery to two current contacts held against the wall of the casting, and spaced at a distance somewhere between 1 and 12 in. apart. For the majority of castings the current contact spacing was 2 or 3 in. Exhibiting a diagram of the circuit, Mr. Faulkner said the current in the circuit was adjusted by varying the rheostat until the potential drop indicated by the deflection of a galvanometer connected to two potential contacts reached a pre-determined fixed value. From a calibration curve the thickness of the wall corresponding to the current registered by the ammeter was determined.

The subject was very important, as had been emphasised by a writer who, discussing the importance of developing our export trade, had stated that, of a consignment of gear cases arriving at a South American port, three had had their cast-iron covers cracked, so that they were useless. The thickness, in parts, was little more than that of paper, and there had been grave anxiety as to the condition of the remaining castings. Such experience would harm the reputations of exporting firms.

In conclusion, Mr. Faulkner said he would not discuss cast iron metallurgy, because Dr. Everest would deal, at the next meeting of the Branch, with some recent American developments in that direction. Those developments were of a particularly interesting character.

All-Welded Blast-Furnace Shell

The Steelton, Pa., furnace of the Bethlehem Steel Company, with an annual capacity of 780,000 tons, was recently rebuilt, the shell all-welded.

Institute of British Foundrymen: Scottish Branch Session Opened

MR. A. L. MORTIMER'S PRESIDENTIAL ADDRESS

The opening meeting of the session of the Scottish Branch of the Institute of British Foundrymen was held in the Royal Technical College, Glasgow, on October 11. Mr. R. Ballantine, Past-Branch-President, was in the chair.

The CHAIRMAN, in opening proceedings, expressed the regret of Mr. Norman Erskine, the retiring president, at his inability to be present owing to absence from home. He offered a cordial welcome to all members at the opening of a new session, and hoped that the attendances throughout the session would be maintained. He said that the Scottish Branch were always pleased to welcome visitors from other parts, and he offered a very hearty welcome to Mr. B. Gale, of Derby. The chairman then introduced to them the new president, Mr. Mortimer, who was one of the young men of whom they were proud. He had won the Surtees Gold Medal and had been an assistant of another very successful past-president, Mr. N. McManus. He therefore came to them with the best of credentials, and they could expect that he would prove an excellent president.

MR. MORTIMER then took the chair. He first thanked the members for the honour they had done him in electing him to the presidency of the Branch. He stated that he would do his utmost to uphold the traditions of the position which had been established by his many distinguished predecessors. Mr. Ballantine had been very laudatory in his remarks, but he agreed with him in acknowledging the help he had had from Mr. McManus, and any success he might attain could be ascribed to the fact he had been privileged to have that gentleman as a guide, counsellor and friend for the past 20 years.

Mr. Mortimer then referred to Mr. Erskine's work for the Branch during his term of office; his business required him to be away from home a great deal, and he had often travelled at much inconvenience to himself in order to be present at the meetings or attend to the work of the Branch. He felt sure that they would wish him to express and to make a record of their appreciation of Mr. Erskine's efforts on behalf of the Branch. He thought they all hoped that they would have the services of Mr. Erskine for many years to come.

The PRESIDENT then intimated that they had present the winners of the Sir Archibald McInnes Shaw prizes at Stow College. He asked the winners to come forward, shook hands with each, and congratulated them on their success, which he hoped was only an indication of greater successes to be attained in their careers.

PRESIDENTIAL ADDRESS

The PRESIDENT then delivered the presidential address, in the course of which he said:—"Mr. Ballantyne and Gentlemen—It is now two years since a presidential address was presented to this Branch. At that time we had just entered upon the war, and no one could foresee what lay in front of us. Two years of fluctuating fortunes have passed. We had our days of complacency when the war was to be won from our armchairs; we have seen the fall of France; we have passed through the grim days of Dunkirk to the battle of Britain; and during all that time the battle of the Atlantic has gone ceaselessly on. Our country has suffered losses of brave men and gallant ships—ships, many of which we had helped to build, and whose loss brought home to us, as nothing else could have done, our responsibilities in helping to win this unceasing battle.

"Of the many lessons learned during these bitter days there was none so stark nor so urgent—and none remains so urgent—as the question of production in our factories, engineering shops and shipyards. On these vital services depends the fate, not only of our soldiers, sailors and airmen, but of our country, and possibly also the fate of freedom throughout the world.

The Industrial Front

"In assessing the tremendous issues involved in this titanic conflict, we ordinary people are apt to consider ourselves to be somewhat remote from them. That this is not so is well proved by the tremendous efforts of the Government to 'speed the plough'; to build the ships, the tanks, the shells, and the guns; and we, in our different spheres, are playing a vital part in our everyday work in our voluntary services, and in our technical institutes.

"It is well known that in wartime the *tempo* of production, of mechanical advance, and of improvisation increases at a tremendous rate. It is, therefore, with particular pleasure that I pay tribute to the courage shown by your Council in deciding to carry on the normal functions of this Branch, when so many other institutes of a like nature had decided to close down for the duration of the war.

"That their decision had the approval of the members as a whole is shown by the fact that the attendance over the past two years has been but little below normal, while it is also noteworthy that the financial position of the Branch is as healthy as ever. The Council recognise, and gratefully acknowledge, that this is due, in no small measure, to the keenness and enthusiasm of the members themselves, despite the fact that many of them are working abnormally long hours, and giving much of their scanty leisure time to civil defence work.

"I sincerely hope that our members will make every endeavour to continue the good work and, by personal contact, by Papers, and by discussion, help to keep alive, and to further, the interests not only of the Branch, or even the Institute, but of the industry as a whole.

Impact of War on Foundry Practice

"War has brought to the foundry industry many new problems and some opportunities. Among the latter has been the opportunity to recover some of the work that was given over to fabrication in the years just prior to the war. Much of the credit for this recovery is due to the work of the Technical Committee of the Institute, whose reports, showing what can be done with cast metals, have rendered a signal service to the industry as a whole.

"In the field of design the need for rapid production has compelled designers to curb their fancy for curves and contours, and to confine themselves to simpler outlines, where such are possible without any reduction in the necessary strength of the casting. Undoubtedly the war has brought some advantages to the industry, but I think the consensus of opinion will be that it has brought, in greater measure, increased, and increasing, difficulties.

"The question of supplies of almost all materials used in the foundry is now a serious one, and much forethought and planning are necessary to ensure regular supplies and freedom from irritating delays. A major problem is the new sources of supply for pig-iron and scrap, involving, as they do, the rigid control of melting practice. In many cases chemical control is a particular worry due to the major available supplies of pig-iron having a high phosphorus content.

"Many previous sources of supply for imported materials are now closed, and new ones have had to be found; and frequently these are much further away than the old ones, and are thus responsible for additional burdens on an already overloaded transport and shipping industry.

The Labour Problem

"Perhaps one of the biggest problems facing the foundry industry at present is that of suitable labour. This problem is probably felt more acutely in the foundry than in other industries, due to the heavy and exacting nature of the work, coupled with the dark and depressing conditions under which it has often to be carried on. In this sense, the recruitment of female labour in the foundry is often difficult, as most girls like to picture their war effort as something connected with shining machines, smart overalls and becoming caps. Despite the difficulties many women are being absorbed into the foundry. It is fairly well known that the employment of female labour in core-making has been in practice in many foundries over a long period of years, and, in this sphere, women and girls have proved very smart and efficient. Success in this line is achieved mainly by efficient instruction, care being taken to ensure that the girl understands thoroughly the why and the wherefore of everything she does. Having absorbed that instruction girls can generally be relied upon to carry on without question, and often each girl evolves a technique of her own and shows an aptitude for certain classes of work, which, if fostered, will make her work proficient both in quality and quantity.

"The acuteness of the labour question has made the introduction of female labour into other parts of the foundry both urgent and imperative, consequently we now find girls employed on small machine-moulding work, sand mixing, sand blasting of small castings, and on light fettling work, etc. Under these conditions the strain of supervision becomes much more intense, but in the majority of cases, with careful instructions, girls prove to be very apt pupils.

"These represent but a few of the problems that confront the foundryman in time of war and I have no doubt that many of the members present could add very freely to the list. Fire-fighting, black-out, the adjustment of casting times, the serious question of additional strains imposed by wartime conditions, the physical and structural adjustments necessary to overcome them, represent but a few of the problems that come readily to the mind. In spite of all its difficulties, the foundry industry is meeting and beating its problems without show or pretention, and I believe it will go on meeting and beating its problems until the universal problem of whether free men shall continue free men is solved, let us hope, for all time.

The Post-War Apprentice

"I would go even further. I hope that we have the courage and faith to prepare to meet future problems. One can visualise many fresh problems arising after the war, and, with most people, I think we shall be content to meet them as and when they arise. There is one problem, however, for which I think we should make some preparation and so have a plan ready to put into operation when the need arises. I refer to the need for a revised and comprehensive plan of apprenticeship training.

"As the youths returning to industry after the war will have lost much of their time and opportunities, because of service given to their

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country, the onus for providing new opportunities must rest with the industry, and to a great extent with this Institute.

"I can remember, on returning from the last war, attending the works school as an apprentice and spending four hours per week studying the technique of my job. As the establishment in which I worked was essentially an engineering works with a very large preponderance of engineering apprentices, and the foundry was still the cinderella of the engineering industry, the foundry boys were left to the tender mercies of the engineering teachers. The sum total of their learning was a certain proficiency in mathematical knowledge, together with the proud possession of a few unauthenticated facts on foundry practice, gleaned usually from the foundry or coreshop foreman. The source of the teacher's knowledge was made very obvious by his regular appearances in the foundry in earnest conversation with the shop foreman on class days.

"The need for some form of comprehensive foundry training was recognised by some members of this Branch, and Mr. Campion's efforts in this connection deserve special mention, both in connection with his own classes and the scheme which eventually emerged. This provided for a three-year course of training in Foundry Practice and Science at the Stow College, under the auspices of the Education Department of Glasgow Corporation. This scheme was fortunate in that it was launched, and for a considerable time maintained, in very capable hands, but latterly its direction changed and deteriorated except in the higher or metallurgical classes.

"Since most of the course is now in abeyance there is now time and opportunity to replace and reconstruct these classes in the light of past experience, and to make use of new knowledge so that when the youth of our industry return from service, or when those now working long hours again have leisure, they, having done their best for us, will be made to feel that we have not been remiss in doing our best for them.

An Important Duty

"The question of apprentice training is an involved one. It must always be borne in mind that we have to deal with the material to hand, and if a boy or youth is prepared to give up two or three nights per week to classes, we have certain responsibilities to discharge toward him. While the brilliant boy will always make good, our responsibilities will always remain to the boy who is less brilliant. In short, while we should foster the brilliant boy as much as possible, the aim should be to raise the *general* standard of knowledge and proficiency.

"To achieve that we have, I think, to commence very cautiously, to treat the newcomer as a very raw recruit, and to assume that he knows nothing of the elementary principles of foundry work. Very often, much of the lack of understanding experienced by teachers in the higher classes can be traced to this failure to grasp important fundamentals in the early stages, thereby impeding progress through all the later stages. The first essential for a teacher, therefore, is to see that his pupil thoroughly understands the elementary principles of the work he is being taught, and that he carries that understanding with him through all his later tuition.

"Much could be done to enlarge the scope of training by appointing teachers who are specialised in some particular form of foundry work. For instance, very few teachers, especially young teachers, can be expected to have a thorough and competent knowledge of all forms of non-ferrous and ferrous practice. The technique of the groups themselves differ sufficiently—as in iron and steel—or brasses and aluminium—to justify teachers with specialised knowledge of one, or possibly two, of these subjects being appointed, and the classes so organised that the best advantage can be taken of that specialised knowledge. This arrangement would be of advantage to teacher and pupil alike.

A Good Future

"One other feature which, I think, could be usefully introduced into any revised plan of training is best illustrated by my own experience while taking classes at Stow College. As most of you will probably know, if only by going back to your own early recollections, the problem of keeping boys in order, when they have completed what they consider to be their night's work, is one that would tax the wisdom of Solomon. I looked about for some way of overcoming the various forms of exuberance, so dear to a boy's heart when he has completed a task, and eventually I hit upon the idea of making the last fifteen minutes 'question time.' A boy was to be allowed to ask questions about any problem he did not understand, or about any things he had noted in the foundry and which had puzzled him. The result astonished me. The problem of how to hold them gave way to the problem of how to get rid of them. Their questions were keen and intelligent; they persisted long after the recognised stopping time; and quite often left the teacher feeling like the Brains Trust after an innocent question about flies. My point in quoting this experience is to show that it may be profitable to allow for some of the initiative coming from the pupils themselves. Their questions reveal their minds and interests. It gives the necessary confidence to a boy who, from timidity or fear of being thought stupid, refrains from asking questions until he finds that others are capable of errors. His confidence is then restored and his participation in the things that matter to him are assured.

"I am certainly of the opinion that when reshaping apprentices' education the factors I have outlined should be taken into consideration, so that we may devise something that will prove of real and lasting benefit, not only to the boys concerned, but, through their efficiency, to the industry they represent.

The Three V's

"In presenting a Presidential Address it is customary to have a theme. In this connection I have a very vivid recollection of a former very eminent president of this Branch debating upon the difficulty he had experienced in arriving at a suitable theme for his address. As his address was presented in the halcyon days of peace I can appreciate that the more or less mundane doings of that apparently distant, but desirable, time did not offer the scope presented by these hectic days of heroism, sacrifice, and slogans. My own difficulty has not been to find a theme, but to select one from the welter of slogans and phrases that abound, and fit to the needs of the foundry industry coupled with the desires of mankind as a whole. The most dominant and universal of the slogans prevailing to-day is undoubtedly the V for Victory slogan. It is to be found everywhere—on streets, on walls, on moulding boxes. It has swept the oppressed countries of Europe with a message of hope. It has become something in the nature of a code sign for our Premier. It has always struck me that while V for Victory was an inspiring phrase, it was incomplete. It lacked the urge necessary to complete it. I therefore give you as the theme of this address the complementary phrase of "Hasten the day, the day of Victory."

"Vanguard"

"It has also struck me that V stands for several other things besides Victory. For instance, it stands for vanguard, and we on the industrial front are in the vanguard of this war as never before in all history. It is not too much to say that on the achievements of the industrial front depends our ability to achieve on the fighting fronts. The tide of battle has shifted to Russia, and because of that we enjoy a period of respite from the worst horrors of bombing, but that respite should not apply on the industrial front.

"Our cabinet ministers appeal for aid for Russia because Russia's need is urgent, and nobody but a dullard can fail to realise it. It is less easy, far less easy to understand and 'see' the need for full time, heavy, tedious and routine work, not for one week, but every week; not for one class of worker, but for all fit men and women in every occupation from Land's End to John o' Groats.

"When periods of physical strain or mental stress threaten to overcome us let us look across the narrow strip of water that separates us from the Continent; what do we see? The city of Paris in a state of siege; hostages being murdered, and the curfew clamped down on a once free and proud population. Norway and Holland are under the heel of the Gestapo. Thousands of Poles are being driven into literal slavery. Czechoslovakia is a gravevard of freedom, a cemetery of brave and defiant spirits. The Greeks and Belgians are risking death to sabotage the Nazi war machine. Even remnants of the Serbs are waging active war against the invader. In the face of all that suffering we are asked to give of our best on the industrial front. Are we being asked for too much? Look again at the picture, and let us vow, that by our most prodigious and sustained efforts, we will hasten the day when such bestialities will be swept from the face of Europe.

"Vision"

"Let us look for another V, a less sombre V. V stands for Vision. In the sweat and turmoil of our present and future efforts let us try to preserve a little vision towards the day when the tumult and the shouting will have died and the Captains and Kings departed, the time when the aftermath will have set in and the immediate problems of peace confront us. Vision and foresight exercised now may go a long way towards preventing misery and suffering when that day arrives. It is true that this will be reflected more in our national plans, but we, in our industries and Institutes, by harnessing our vision and assessing our problems, can make our contribution to that plan. Let us hasten the day.

"Verdict"

"Finally, in our private V campaign let us take 'verdict.' When the verdict of history comes to be written on this unhappy period and all the pros and cons of its campaigns—its mistakes, its heroisms, and sacrifices—can be judged in the cold and impartial light of remote time, I am convinced that one of the brightest chapters can and will be devoted to the great battle won in the workshops and factories of free nations, everywhere, and not least in the workshops and factories of this country in which, from the period of Dunkirk, men and women slaved to hasten the day of victory and freedom. Let us dedicate ourselves anew and echo the immortal words of William Blake when he wrote:—

'I will not cease from mental fight,
Nor shall my sword sleep in my hand
Till we have built Jerusalem
In England's green and pleasant land.'"

VOTE OF THANKS

MR. A. CAMPION, in proposing a vote of thanks to the president for his address, said that it was very pleasant to see one of the younger men occupying the position. Mr.

(*Continued on page* 288.)

STANTON-DALE

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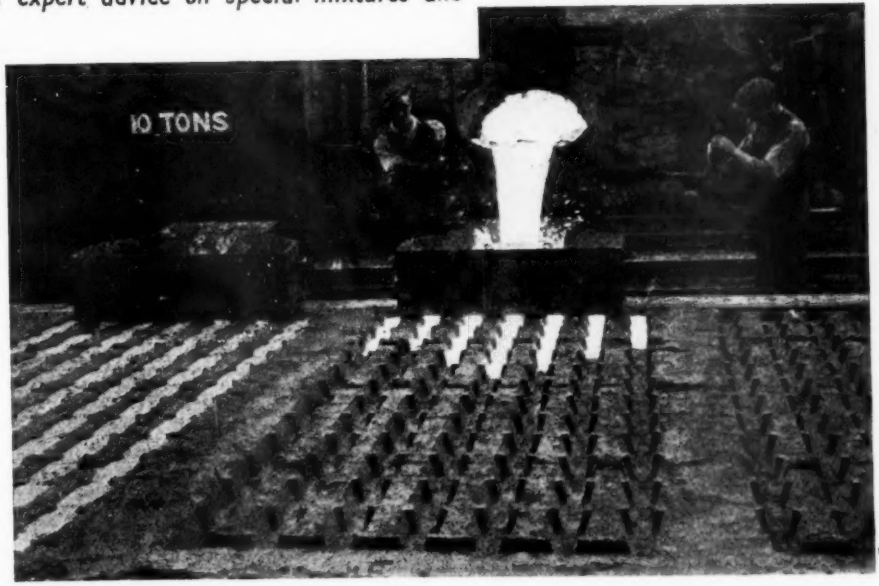

THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

The Problem of Rubber-to-Metal Adhesion

By T. H. MESSENGER (Rubber Research Association)

There are few problems which have been outstanding so long as that of devising a method of adhering soft vulcanised rubber to metal, regardless alike of the nature of the metal and of the rubber mix, and of producing a bond which is effective over a wide range of temperature. The unique properties of rubber, combining as it does elasticity, resistance to abrasion, and a controllable degree of hardness, with resistance to most chemical corrosives, make it most useful as a lining for chemical plant, bearings, roller coverings, and like applications.

The first step of importance, and indeed the only one until some 15 years ago, was taken with the early discovery that hard rubber, or ebonite, has a much higher bonding strength to iron than has soft rubber, and in cases where service conditions permitted this intermediate layer, satisfactory results were obtained, since the soft rubber could be welded homogeneously to the ebonite foundation. This practice was universal in securing the old-type solid rubber vehicle tyres to the steel rims. However, the presence of a hard interlayer gave rise to technical difficulties in manufacture and sometimes in service, and innumerable experiments were made in search of chemicals which would allow direct vulcanisation of soft rubber to metal. Any process which prevented the two components from falling apart under their own weight seems to have encouraged inventors to rush to the Patent Office with their discoveries, but it would appear that any success achieved was due more to accidental fulfilment of the necessary conditions than to the presence of the special ingredients.

Modern Methods

Not until 1927 does the modern chapter in the story open, and since then considerable progress has been made, though there is plenty of scope for more. Excluding for the moment the treatment of light metals, there are now two main methods available. They are:—(1) The use of special adhesives; and (2) electro-plating the metal before applying the rubber. Of these, the former is simpler, but the bond is less stable to high temperatures. The second gives excellent results, but requires to be worked by specialists.

Thermoplastic Cements

When H. L. Fisher, chemist of the B. F. Goodrich Company of America, broke all rules of conventional rubber technology by mixing sulphuric acid into raw rubber, nothing was further from his mind at the time than attaching rubber to steel. He was engaged in seeking to convert rubber into gutta-percha, a material which has the same chemical composition as rubber, but a slightly different molecular structure. In his first experiment he mixed 5.5 grs. of sulphuric acid (using fossil flour as a carrier) with 50 grs. of rubber on a laboratory roll mill. The rubber turned red-brown, became sticky, gave off the odour of sulphur dioxide, and then suddenly stiffened and became so hard and tough that it could only be removed by means of a chisel. This was not gutta-percha, but it was the opening of the door to a range of useful products, of which the "Vulcalock" cements for bonding rubber to metal are prominent members.

Sulphuric acid was replaced by an organic sulphonyl chloride or similar compound, which, on being heated with rubber for several hours at 125 to 130 deg. C., converts the latter into an isomer of rubber, a tough, thermoplastic material which, when cold, has a high adhesive strength towards both metal and rubber, and which can therefore serve as a bond for these two dissimilar materials. Metal to be coated with rubber is covered with a sheet or solution of the thermoplastic cement, rubber is laid on, and the union effected by heat and pressure.

If, however, the metal concerned is in the form of a tank which must be treated *in situ*, a solution of the adhesive is applied to the clean metal, the solvent is evaporated, and a coating of vulcanisable rubber cement and a sheet of vulcanisable rubber stock are applied in succession. The sides of the tank are temporarily extended upwards and the rubber lining is vulcanised by hot liquid in the tank and extension. The process is used successfully for lining ball mills with abrasion-resisting rubber, gravel shutes, storage and pressure tanks for corrosive chemicals, acid tanks and "eggs," pipes and valves, filter press plates and frames, rubber bearings, sleeves for propeller shafts, acid-proof fans, railway and road transport containers, and for many other similar jobs.

Meeting Higher Temperature Needs

Bonds depending on thermoplastics of this nature are subject to the limitation that they must not be subjected to temperatures exceeding about 60 deg. C., since above this point the heat causes the adhesive to soften. However, progress has been made in this field, and to-day "Reanite," a product of Canadian origin, is available. This also is a rubber isomer. In bonding rubber to metal two or more thin films (0.00001-0.005 in. thick) of "Reanite" are pressed together between the rubber and metal, the hardness of each successive film being progressively less from the film adjacent the metal to that adjacent the rubber. At room temperatures the strength of the bond is about 900 lbs. per sq. in., and a high degree of strength is retained even up to temperatures as nigh as 150 deg. C.

An interesting recent development is the introduction of "Ty-ply," a proprietary adhesive which depends on another derivative of rubber, namely, rubber hydrochloride. Bonds of a strength exceeding 1,000 lbs. per sq. in. at normal temperatures are given, and at 100 deg. C. loads of over 600 lbs. per sq. in. have been observed. This adhesive is obtainable in several grades, and is effective with synthetic rubber as well as with natural rubber stocks. Adhesion is described as "good" in bonding natural rubber to steel, cast iron, terne plate, tinplate, and lead; as "fair" with stainless steel, tinned copper, chromium plate, cadmium plate, and aluminium; but as only "poor" with brass, copper, Monel metal, nickel plate, zinc, galvanised iron and Dowmetal.

An Early Experiment and a Modern Adaptation

Writing in the "India Rubber World" in 1889 an anonymous author recalls his experiences with an old foreman in a rubber works. Having to cover a shaft with rubber the latter would send out to the butchers for some raw liver. This he would smear over the cleaned shaft and obtain after various further operations a well-bonded rubber covering. This old hand appears to have stumbled across a useful hunch, for the inclusion of hæmoglobin, a blood protein, is an essential step in the preparation of a patented adhesive, based on rubber latex, which has had considerable commercial application. In brief, a dispersion or solution of a proteid (*e.g.*, glue, albumen, or hæmoglobin) is mixed with rubber latex, suitable proportions being 40 parts of hæmoglobin to 50 parts of latex solids; 10 parts of a vulcanising agent, which may include a vulcanisation accelerator, may be added. A film of this preparation is applied to the article to be coated, and after drying the proteid is rendered insoluble, for example, by treatment with formaldehyde, a bichromate, and light, or in the case of albumen by heat sufficient to coagulate the albumen, say, 150 deg. F., but not to vulcanise the rubber. Rubber is applied to the dried film, if necessary after brushing over with a solvent, and is vulcanised thereon. Bonds of upwards of 600 lbs. per sq. in. are obtainable with this type of adhesive, and the treatment is said to be effective with aluminium.

Electrolytic Methods

The adhesive strengths of such solutioned bonds were adequate to meet the comparatively mild demands made by the service conditions of the applications mentioned above, but recent years have seen a rapid growth of rubber-in-shear mountings for use in motor cars and aeroplanes, particularly for cushioning engine vibrations, and for such purposes more exacting specifications are in force, particularly as regards separation at the edges. This particular field of application has grown *pari passu* with an entirely different method of attaching the rubber to the metal member, namely, that employing electrolytic brass plating of the metal. Curiously enough, this involves flying in the face of yet another principle fundamental in rubber technology. For many years the greatest care has been exercised by rubber manufacturers to prevent all trace of copper and certain other metals entering into composition of the rubber, since such inclusions lead to premature "perishing" of the rubber. Yet he is confidently vulcanising his rubber to a layer of brass containing 70 per cent. copper! But it works; and it works well. It is a case in which the practical man has outdistanced the scientist since no theory so far offered by the latter to explain the phenomenon satisfactorily fits all the facts.

Care is needed in applying the adhesive method, but the most meticulous attention to detail is required in the brass-plating procedure, and for this reason its use is confined to specialists. In outline the method is simple enough, but it has been found essential to maintain conditions very strictly between narrow limits if the best results are to be obtained. The composition of the plating bath and of the brass laid down, conditions at the electrodes, and temperature and humidity of the atmosphere to which the fresh coating is exposed are all more or less critical.

Technique Detailed

The metal to be treated is first scrupulously cleaned, if necessary by degreasing, followed by electrical treatment in alkali. After a thorough wash, a flash coat of copper is sometimes given, and the article immersed in the brass-plating solution. A typical composition for this is copper cyanide 4 oz. per gall., zinc cyanide 2 oz. per gall., and sodium cyanide 7 oz. per gall. The tendency for the composition of the bath to change must be counteracted by careful control measures. Operational conditions vary somewhat to suit individual circumstances but current density is usually from 2½ to 10 amps. per sq. ft. (anode density not exceeding 300 amps. per sq. ft.), *p*H value 10.3 to 11.7, temperature 80 deg. F. The composition of the brass deposit should be 69 to 70 copper and 31 to 30 zinc per cent. The unvulcanised rubber stock should be applied to the article as soon as possible after the plating is dry and heat-vulcanised under pressure.

(*Continued on page* 290.)

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Progress in Coal Upgrading and Utilisation

INSTITUTE OF FUEL PRESIDENTIAL ADDRESS

At the recent meeting of the Institute of Fuel, in London, MR. W. M. SELVEY, Wh.Sc., M.Inst.C.E., M.I.Mech.E., M.I.E.E., after being installed as president, gave his presidential address with the title: "The Hundred Thousand: An Engineers' Philosophy." Reviewing mainly progress in fuel up-grading and in electric power station engineering, he had been greatly impressed by the fundamental influence in the creation of our modern world by what was generally known as the "up-grading" of fuel, including the great step forward made by the production of high-grade furnace coke. Great Britain was the pioneer when Abraham Darby changed over from the use of charcoal to coke in the blast furnace in 1709. Whilst raw coal continued to be used in Scotland in small blast furnaces until 1937, and even charcoal was used in Cumberland until three or four years ago, coke was now the universal fuel for iron production, with consequent great increases in blast-furnace outputs.

In steelmaking the old crucible process invented by Huntsman in 1740 was superseded by the Bessemer process in 1858 and by the Siemens process in 1868. This necessitated the solution of a group of fuel problems which gave the steelmaker a crucible of enormously greater capacity than the crucible containing one or two hundredweights of the Huntsman process, and one which, in its up-grading of coal into producer gas, gave to the steelmaker a control of the temperature and conditions in the open-hearth furnace never hitherto possible.

The process of producing uniform steel quality, continued the speaker, had been accelerated by the development of gas-heated mixers giving material of uniform composition to the open-hearth furnace, of gas-heated soaking pits where ingots were brought to the right temperatures before rolling or forging, and gas-heated pre-heating furnaces in the rolling mills. During the last few years coke-oven gas had rapidly replaced, particularly in the Sheffield area, coal as a furnace fuel, increasing fuel efficiency and improving quality. The whole process of steel-making to-day, both from the point of view of steel quality and efficiency, had been improved out of recognition by the up-grading of raw coal to gas.

Gas Grids and Hydrogenation

As regards the future, he looked forward to an era when the use of solid fuel would gradually be confined to special purposes. The distribution of medium calorific gas would, of course, mean a network of mains at high pressure, but this was a development which was already coming about for other reasons. Undoubtedly, the first effect would be an increase in the price per therm. In the case of the coke-oven gas grid, for instance, the cost of coke-oven gas was more expensive than the alternative fuels, but to a large user it was very low compared with town coal gas. It was the development, however, from this situation which made for future progress. Because of the higher price per therm much greater economy in use was developed. The second step was that this caused the development of new "tools" which in turn were used to perfect a process which would have been impossible in the old circumstances. Only a casual glance at statistics would show that tremendous progress had been made in the last two decades in the therms required per ton of steel made, starting the balance-sheet from the raw coal and the crude ore.

It was admitted that the question of hydrogenation was still in the background of many minds, but it was quite an unsuitable subject to exploit for political ends. The scientists and engineers had years of work before them to discover, not how to do it, but how to place it as a practical scheme in parallel, and not in competition with other activities which at present gave the same end products. But it was doubtful whether there had been any greater up-grading of fuel than when the power station began efficiently to use fine slacks which had previously either smouldered away in colliery boilers or on burning pit heaps.

Fuel and Electric Power

Discussing the subject of fuel and electric power, the speaker, referring to steam turbine efficiency, said that around 1909 they already knew, from the scanty research then possible, that they had an inherent possibility in their blading of 90 per cent. efficiency, though for a practicable machine it was then worlds away. They were proud to approach 70 per cent. In a footnote to a Paper read before the Institution of Electrical Engineers in 1904 he had predicted that the ultimate realisable turbine efficiency was 85 per cent. To-day he thought it was safe to say that this had been realised, perhaps with 1 or 2 per cent. plus margin in the record cases for both what used to be called the impulse and reaction types.

On the boiler side they were even more active. In 1907 to 1909 two boilers, one Babcock and one Stirling, were elaborately fitted up as test boilers and with them were run over 100 trials. Having no instruments they had to design them. In this work they struggled with arches until they could get any burning rate or CO_2 they desired. It paid to burn them out, as quick and cheap rebuilding became a fine art. They found out all about the melting-point of ash, and, what was more, its volatilising point, a matter which was only just coming up again in the last few years. They made the chain grate into a machine tool and found out its final limitations. They burnt up pit heap duff 50 years old and covered Wallsend with grit.

They had fans which gave 4¾ in. w.g. in the days when ½ in. was the normal chimney draft. A 20,000-lb. boiler was made to yield 32,000 lbs. per hr., and a 33,000-lb. boiler which could not get anything like this on its official test was brought up to 50,000 lbs. per hr. They actually struck caustic embrittlement, though not, of course, knowing what it was, although the diagnosis was sound—that of over-strained metal. They, of course, struck the problem of sampling of coal, and evolved a system which while suitable for research was quite impracticable for everyday life.

Turbine Blade Material

After 1911, continued the speaker, things began to be different. The future, often clearly visualised, had to wait on materials. They wanted a turbine blade material which they could run red hot. They found it, but it was not workable. To-day the researches of the Detroit Edison Company on 18/8, and the like, did enable them to use red hot steam. Ferranti was, however, the real pioneer of high-temperature steam with his Sheffield turbine at Vickers. They had made 900 deg. F. steam at Dunston in 1911, but they burnt out their mild-steel tubes, and in any case they could not have utilised it. They were shortly going to run with steam at 950 deg. F. in the newest Battersea unit. To-day a fairly large unit could be purchased to give round about 90 per cent. efficiency, and there was a direct relation between the price and this figure. Even an everyday medium-sized unit suitable for ordinary load factor would have an efficiency of, say, 82 per cent. to 84 per cent. The emphasis had to-day moved from efficiency to upkeep, the aim being to design a boiler that could stay on the line indefinitely with small loss of efficiency.

Further, they had, on paper, explored all the possibilities of feed heating and steam reheating, but they could not be carried forward because of the low steam pressure. Higher steam pressures were, however, put into action, and the next station was at 400 lbs. pressure. The Americans, with their much greater resources and market, now began to take the initiative. Kreisinger and his colleagues of the Bureau of Mines were turned on to boiler problems, and had the good fortune to get in at the very start of the use of pulverised fuel. This had ended in making boilers of 1,450 lbs. pressure, 900 deg. F. steam of 1,000,000 lbs. per hr. output, and of turbines as large as 160,000 kw. These gigantic units had so far no place in this country.

The net result of all this development could best be read in the annual returns of the Electricity Commissioners. At Carville, before starting their economy campaign, consumption figures were 2.78 lbs. of coal per kw.-hr. This went down to 2.33 lbs. The new Dunston came in at 1.7 lbs. per unit, and he supposed the newest Dunston (No. 2) ran at 1.0 lb. or less. Their American friends, however, held the world record for their Fort Washington Station.

Institute of British Foundrymen: Scottish Branch Session Opened

(*Concluded from page* 284.)

Erskine and now Mr. Mortimer were two young men in whom he had taken a special interest, and could be relied upon to carry on the work of the Branch. He thought that the address showed that Mr. Mortimer had a very large V in vision and had given them a lead in taking a very broad view of what may be required of the Branch and the Institute in the future. He had made the education of the young men in the industry a central feature of the address, which seemed to him to be exceedingly wise, as no doubt future entrants to the foundry industry would require to cope with things undreamed of by their fathers. This would call for much wider and more specialised training. He thought one of the efforts of the Institute should be to try and arrange that every lad entering the industry should have the fullest opportunities of training in the fundamentals of his trade, and to this end he thought efforts should be made to allow the lads to attend classes during the daytime instead of at night after a long day's work in the foundry or patternshop. The training should be regarded as part of the lads' work. He asked that the meeting accord to the president a hearty appreciation of his address, and to assure him of fullest support in carrying on the work of the Branch.

MR. H. D. CAMPBELL, in seconding the vote of thanks, said that the address had been inspiring and had suggested a wide range of ideas giving food for thought.

MR. W. Y. BUCHANAN then gave a talk, illustrated by a number of lantern slides on "The Salvage and Disposal of Foundry Waste."

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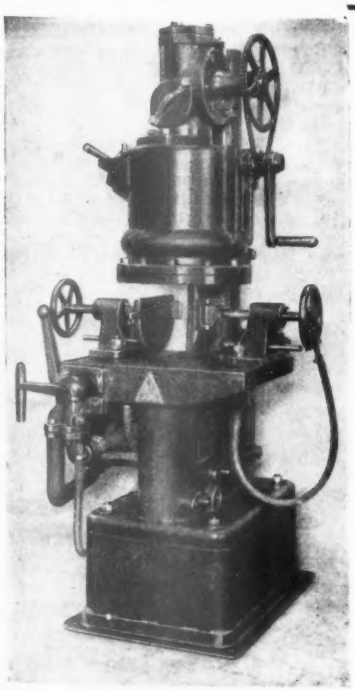

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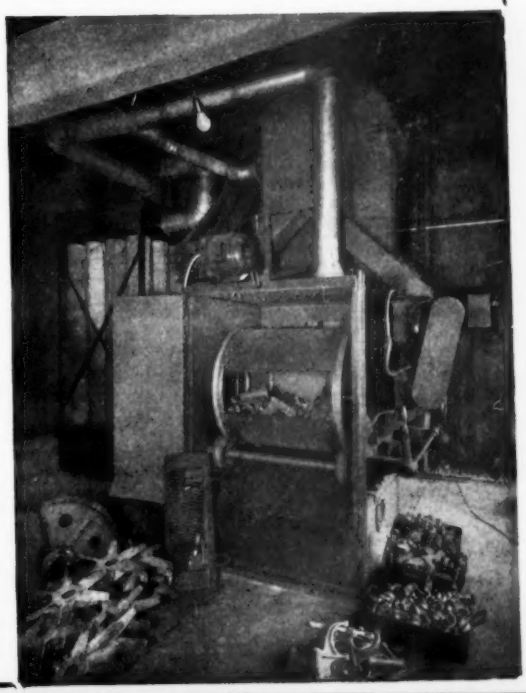

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The Problem of Rubber-to-Metal Adhesion

(*Concluded from page* 286.)

The composition of the rubber stock is not without effect on the strength of the bond. In general a hard tough stock adheres better than a soft stretchy one; the rubber should be thoroughly plasticised; sulphur should be at least 2 to 3 per cent. on the rubber; and a high vulcanising temperature is to be preferred. As vulcanisation accelerators those definitely advantageous include hexamethylenetetramine, di-orthotolylguanidine, mercaptobenzthiazole and some of its derivatives, e.g., the zinc salt and benzthiazyl disulphide, and diphenylguanidine with magnesia. Super-accelerators as a class are to be avoided. The inclusion of reinforcing pigments such as carbon black and zinc oxide is usually beneficial. The bonds so obtained average 500 to 600 lbs. per sq. in. and strength is well maintained at elevated temperatures. Much higher strengths, as high as 1,000 lbs. per sq. in., are observed in individual cases.

Bonding with Non-Ferrous Metals

In the vast majority of articles the metal to which the rubber is to be attached is ferrous in nature. The case of aluminium and its alloys is different and for many years comparative failure attended efforts to secure soft rubber to these metals. Necessity, however, is the mother of invention, and at least two methods, in addition to adhesives which are satisfactory up to a point, are now available. One is a chemical bond, and the other a modified electro-plating process developed in America by Krome-Alume, Inc. A sheet of rubber, natural or synthetic, is affixed by any convenient process, as by vulcanisation.

In the case of aluminium, electro-plating is difficult, partly on account of the electro-positive nature of this metal and partly because of the rapidity with which oxide films are formed on exposure to the air. The Krome-Alume process depends not on removing the film of oxide but on rendering it electrically conducting. The aluminium to be plated is first subjected to the simultaneous action of a solution of oxalic acid and alternating current, the latter under a voltage of 5 for a few seconds, rising later to 50 as the oxide film builds up to a thickness of about 0.0005 in. As laid down under these conditions the film is exceptionally hard and resistant. It is also non-conducting but immersion in a bath of special (unstated) composition renders it sufficiently conductive to permit the deposition of a layer of brass, after which procedure is much on the lines described above. The process can be completed in 22 minutes and bonds of a strength up to 3,600 lbs. per sq. in. have been observed. Aluminium may therefore replace steel in metal-to-rubber mountings in aeroplanes, with marked reduction in weight.

In conclusion, emphasis must be laid on the need for extreme care in all work involving the attaching of rubber to metal. The latter must be freed most conscientiously from all trace of grease and rust; roughening, as by shot blasting or brushing with wire brushes, sometimes helps by affording a mechanical key effect: and all trace of moisture and inclusions of dust and air must be eliminated. So necessary is strict cleanliness in all these operations that special air-cleaning and air-conditioning is sometimes installed in the premises where this work is carried out.

Blast-Furnace Explosions

Gas explosions in blast furnaces which have occurred in Russia on damping down a furnace, after igniting the stack gases, on blowing in steam, on introducing gases from other furnaces and on sudden shutdowns, are surveyed by M. A. SCHAPOWALOW in "Teori. prakt. met." Various suggestions are made for the prevention of these explosions.

Chrome Ore Supplies

ALL PURCHASES TO BE MADE BY THE CONTROL

The matter of obtaining supplies of chrome ore and concentrates has hitherto been left to consumers, the Control merely regulating, by licence, the total tonnage purchased and endeavouring to see that the requisite freight was made available to carry the chrome to British ports.

During periods of extreme freight shortage this has not operated satisfactorily, and the result has been that some consumers have been fortunate in importing substantial quantities and others very little or none at all. This has necessitated transfers between works in order to keep essential industries going, which, apart from the inconvenience caused to these works, has been an additional load on existing transport systems. A further inequity has been that, with constantly varying sea freight rates, some consumers have had to pay substantially higher prices for chrome than other consumers over the same period.

With a view to removing or minimising these difficulties, it has been decided that henceforward the Control will buy all chrome ore and concentrates required in the United Kingdom, and will arrange for its carriage and delivery to U.K. ports. Freight rates will be averaged, and it is hoped by early 1942 to have a schedule of prices for all grades delivered at consumers' works. In the meantime, prices will be standardised at U.K. ports.

Purchases have already been made by the Control, and shipments are coming forward. Consumers are requested to send their orders direct to the Control, together with full despatching instructions. Qualities should be specified, but the Control cannot undertake to supply exactly to specification. It does, however, undertake to supply chrome suitable for the purpose for which the consumer ordered it. Orders should normally be sufficient for three months' requirements, although, to commence with, only part deliveries may be possible. Consumers who have storage accommodation for considerably more than three months' requirements, and would be agreeable to storing on behalf of the Ministry of Supply, should notify the Control to this effect. Prices will be c.i.f. cost to the Control, plus clearing charges f.o.r. port of arrival. Licences to purchase from the Control will not be required.

Orders and inquiries should be addressed to the Chrome Ore, Magnesite and Wolfram Control, Ministry of Supply, Broadway Court, Westminster, London, S.W.1.

Reports and Dividends

Babcock & Wilcox—Interim dividend of 4% (same).

Tweedales & Smalley (1920)—Interim dividend of 2½% (same).

Ferranti—Dividend of 6%, free of tax (same), for the year to June 30 last.

Broken Hill Proprietary—Dividends of 9d. per share on the fully-paid shares, and 4½d. per share on the partly-paid shares.

R. & W. Hawthorn, Leslie—Profit for the year to June 30, £132,271 (£161,536); final dividend of 7%, with a bonus of 5%, making 15% (12½%); to general reserve, £50,000 (£85,000); forward, £52,826 (£51,166).

T. M. Birkett & Sons—Net profit to July 31, after deducting A.R.P. expenditure, income tax and E.P.T., and depreciation, £10,454 (£12,613); dividend of 15% (same); to reserve, £7,500; forward, £13,024 (£17,114).

Blakey's Boot Protectors—Net profit to June 30, after E.P.T., and all outgoings other than income-tax, £37,309 (£36,533); income-tax, £20,694 (£19,424); final ordinary dividend of 7½%, making 15% (same); forward, £31,502 (£24,901).

William Doxford & Sons—Net profit for the year to June 30, £155,932 (£232,899); reserve for taxation, £50,000; general reserve, £25,000; ordinary dividend of 12½% (same) and a participating payment of 10% on the preference shares, again making 6% for the year; forward, £34,504 £31,072).

Kayser, Ellison & Company—Profit to June 30, after taxation, bad and doubtful debts, etc., £114,102 (£111,767); to depreciation reserve, £40,000 (same); to general reserve, £15,000 (£16,490); to special reserve, £5,000 (same); staff fund, £5,000; final ordinary dividend of 12½%, making 17½% (same); forward, £18,473 (£19,121).

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Lynton Dropforgings, Kerfoot Street, Warrington, Lancs—£6,000. H. Hoyle and C. Marsh.

Kingsgate Engineering Company, 477-9, Green Lanes, London, N.13—£3,000. H. Simons.

H. J. Stone Steel Company, 21a, High Street, Wellingborough—£2,000. H. J. and H. B. Stone.

Douglas Engineering Company, Horton Road, Datchet, Berks—£3,000. F. D. Tharby and S. E. Linnit.

Hamco Metal Pressings—£1,000. A. H. D. Fairbarns, 11, Sheffield Street, London, W.C., subscriber.

Vaughan Capstan & Engineering—£1,000. H. J. W. Portlock, 151, Hampton Lane, Solihull, subscriber.

South Thoresby Pits, South Thoresby, Alford, Lincs—Directors in lime, sand, etc. J. Harrop and R. W. Ellis.

Manchester Press Tool & Gauge Company—£2,500. J. Faulkner and M. Rubin, 20, Brazennose Street, Manchester.

Leigh-Kenwood Engineering Company, 18, Fleet Street, London, E.C.4—£3,000. J. A. Leigh, R. K. Taylor and W. H. Inwood.

W. H. Tomlinson & Son—Toolmakers and machinists. £2,000. A. and G. Tomlinson, 66, D'Eyncourt Road, Wednesford, Staffs.

Ch. J. Neuman—Engineers, tool manufacturers, etc.—£3,200. C. J. Neuman, 4, Hanley Court, Watford Way, London, N.W.4, subscriber.

Leslie Dyche—Manufacturers and repairers of tools, machinery, etc. £1,000. L. Dyche, Delwyn, Birmingham Road, Bordesley, near Redditch.

A. E. Williams & Sons (Staines), Bell Weir Works, Wraysbury Road, Staines—Tool makers, engineers, etc. £1,000. A. E. & I. F. Williams.

Forged Alloy Steels—£5,000. G. Blair, "Glenshee," Millfield Road, Whickham, Newcastle-upon-Tyne; R. and H. Jennings, and A. Southwick.

J. Cameron & Company, Canal Mills, Brandon Street, Armley Road, Leeds, 12—Electrical engineers. £1,500. D. M. Dixon and A. Cameron.

Jem Alloys—Metallurgists, etc. £1,000. John E. Moore, Joseph E. Moore, H. B. Connell, T. Mackie, and F. Fox, 315, Toller Lane, Bradford.

Metals Interchange Syndicate—To take over from Robert Samuel an invention for chromising metals, etc. £1,000. G. A. Samuel, 50, Clitherow Avenue, London, W.7, subscriber.

Lenssens, King William Street House, Arthur Street, London, E.C.4—To acquire "Lenssens Process" and to carry on the business of welders and repairers of metals, metal sprayers, etc. £1,000. C. Brooman-White, J. Pike, and C. Fairbrother.

Cheswick & Wright—To take over the business of internal-combustion engine exhaust silencers, gas-producing plant for motor vehicles, etc., carried on at Preston New Road, Blackpool, by G. Cheswick and R. N. Wright. £36,000. F. Hawtin, 45, Hornby Road, Blackpool; and P. Shaffer.

Applications for Trade Marks

The following list of applications to register trade marks has been taken from the "Trade Marks Journal":—

"DIATUF"—Cutting tools. L. M. VAN MOPPES & SONS, 10, Charterhouse Street, London, E.C.1.

STAR DEVICE—Sheet metal working machinery. MOON BROS., LIMITED, Beaufort Road, Birkenhead, Ches.

"ROSS"—Safety valves for steam boilers. R. L. ROSS & COMPANY, LIMITED, Edward Street, Stockport, Ches.

"TECHNOTHERM"—Electric welding apparatus. OSCAR CECIL HARTRIDGE, 113, Victoria Street, St. Albans, Herts.

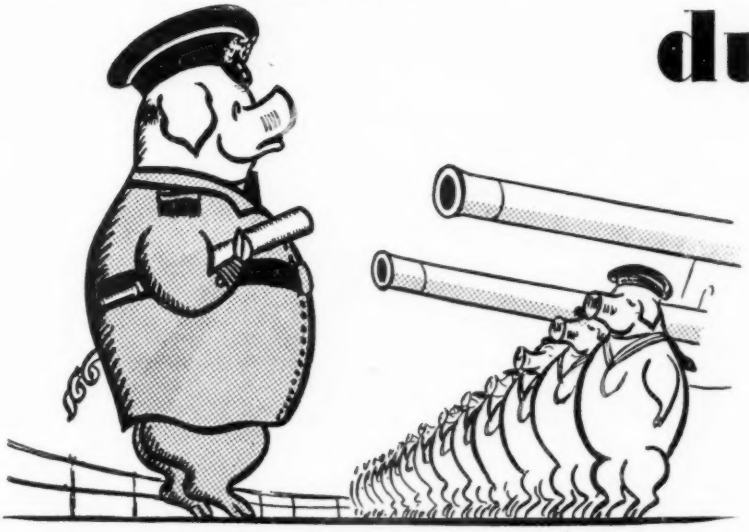
"VOX"—Non-ferrous metal alloys. H. B. BARNARD & SONS, LIMITED, Glyn Street, Vauxhall, London, S.E.11.

"RADUCER"—Heating and cooking apparatus. RADIATION, LIMITED, Thimble Mill Lane, Aston, Birmingham, 6.

"SIGMARINA," "NAUTILA," and "SIGMA"—Rotary pumps, centrifugal pumps, etc. SIGMUND PUMPS (GREAT BRITAIN), LIMITED, Team Valley Estate, Gateshead 11, Co. Durham.

"SYNTRON" and "VIBRAFLOW"—Feed conveyors, dry feeder machines. SYNTRON COMPANY, c/o Stevens, Langner, Parry & Rollinson, 5, Quality Court, Chancery Lane, London, W.C.2.

"Foundries expect every pig to do its duty"



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The Week's News in Brief

Trade Talk

THE OFFICIAL COST of living index figure at October 1 was 99 points above the level of July, 1914, showing no change compared with September 1.

"SOME RECENT RESEARCHES IN WELDING" was the subject of an address to the Stoke-on-Trent Association of Engineers on October 18 by Prof. F. C. Lea, of Sheffield.

DURING THE QUARTER ended September 30 last the Export Credits Guarantee Department assumed liability up to a maximum of £10,994,474 in respect of contracts, policies and guarantees amounting to £24,814,641.

A FURTHER CONFERENCE was held at Carlisle on October 28 between the Shipbuilding Employers' Federation and the Confederation of Shipbuilding and Engineering Unions to consider the unions' claim for an increase in wages.

A JOINT MEETING of the Institution of Chemical Engineers and the Chemical Engineering Group of the Society of Chemical Industry will be held on November 11, 1941, at 2.30 p.m., in the Rooms of the Geological Society, Burlington House, Piccadilly, London, W.1, when a Paper on "Condensation of Water Vapour from Air" will be presented by Mr. M. Hirsch.

THE BOARD OF TRADE as a temporary measure is prepared to issue a limited number of coupons to firms hiring out protective clothing to persons engaged on essential work, in order that they may obtain replacements of their stocks as garments become worn out. Applications should be made on a form obtainable from the Board of Trade, Marsham Court Hotel, Bournemouth.

THE INAUGURAL MEETING of the 188th session of the Royal Society of Arts will be held on Wednesday, November 5, 1941, at 1.45 p.m., when Sir Edward Crowe, K.C.M.G., chairman of the Council of the Society, will read the Inaugural Address on "Co-operation for Production." After the address the chairman will present an R.D.I. Diploma and the medals awarded for 1940-41.

A CONFERENCE in London on October 19 to discuss war production was attended by 1,400 shop stewards from engineering, shipbuilding, and other workshops. Mr. W. Swanson, who presided, said that the best results of the conference would be got not by dwelling on defects of management, but by showing what the workers could and would do to increase production. He deprecated demarcation difficulties raised by the workmen.

PURCHASE TAX.—The following decisions regarding the liability of certain articles to Purchase Tax are published as supplementary to those given in Notice No. 78:—*Chargeable:* All domestic and general purpose types of water softener, irrespective of their capacity or of the materials of which they are made. *Not Chargeable:* Water softeners supplied to specification for purely industrial purposes, *e.g.*, to public laundries, dairies, breweries, etc. This decision will apply in the case of all goods delivered on or after November 1, 1941.

MR. MARK HODGSON, general secretary of the Boilermakers' Society, in his monthly report, refutes suggestions that absenteeism is retarding output in British shipyards. He states that trade union leaders and employers alike are satisfied that the vast majority of the society's members are putting their backs into their job. There is ample evidence to show that the district committees have successfully grappled with the problem of absenteeism and have not hesitated to deal firmly with offenders. This practice will be continued.

POINTING OUT IN THE "A.E.U. Monthly Journal" that it is a common occurrence for scores, and even hundreds, of workers in munition factories, aircraft works, and engineering shops to receive call-up notices, although these establishments may be engaged on war work of the highest importance and urgency, Mr. F. A. Smith, secretary of the Amalgamated Engineering Union, points out that call-ups are automatic, peremptory, and in the literal sense indiscriminatory. "There seems to be no competent authority to protect the vital interests of a particular factory or a particular war trade whose essential personnel is thus decimated. Combing out is the rule; an intelligent and practical examination of the state in which the factory or the trade may be left by the call-up of an entire age group is, so far as we can see, nobody's business." Mr. Smith offers the co-operation of the A.E.U. to ensure maximum use of skilled labour reserves and 100 per cent. employment of productive capacity. He says that effective machinery can be set up by the unions and the managements on a regional basis. Linked with the regional production boards, the capacity clearing centres, and the national joint advisory boards connected with the Production Executive and the supply departments, this machinery could tackle the difficulties of management and workshop organisation, transport complications, and local distribution of materials, and so get rid of bottle-necks.

Obituary

MR. WILLIAM HOLT, secretary of Joseph Webb & Sons, Limited, forgings makers, Irwell Forge, Bury, Lancs, with whom he had been associated for 44 years, died recently. He had reached his 58th year.

LORD ARMSTRONG died on October 16 at Rothbury, Northumberland at the age of 78. Grandnephew of the founder of Armstrong Whitworths, he was formerly on the board of Sir W. G. Armstrong Whitworth & Company, Limited.

MR. ROBERT E. NEALE, who has died, aged 56, at his home in Sheffield, had spent all his working life with John Bedford & Sons, Limited, steel and tool manufacturers. He progressed from a junior position in the office to foreign sales manager and a seat on the board.

MR. ERNEST ANDREW TAIT, foundry manager of the Davy & United Roll Foundry, Limited, Haverton Hill-on-Tees, has died at the early age of 37. Prior to his appointment with the Tees-side company four years ago, he held posts on Tyneside and at Sheffield.

MR. RICHARD GUEST, who was employed by the North British Locomotive Company, Limited, Glasgow, for 37 years, died recently. He was manager of the company's Atlas Works, Springburn, Glasgow, and then transferred to the administrative staff, acting also as labour adviser to the company.

WE DEEPLY REGRET to announce the death of Mr. A. R. Bartlett, which occurred in Newport Hospital on October 10. Until his retirement a few years ago, Mr. Bartlett had been the manager in charge of the foundry of Fraser & Chalmers (General Electric Company, Limited) at Erith, Kent. Under his joint leadership—for he had with him Mr. Whiting—this foundry became one of the foremost concerns in the London area, catering, in the main, for the heavy mining industry. His interest in all technical aspects of foundry practice was profound and sustained even after his retirement. He was particularly enthusiastic on the subject of the training of apprentices and the position which some of his boys occupy to-day is an excellent testimony to that devotion. The Safety-first Campaign at its very inception found Mr. Bartlett a sympathetic supporter, and his Paper on this subject as applied to foundry practice is a "classic" in technical literature, because of its essentially practical character. An activity which took up much of his spare time was the St. John Ambulance Brigade, in which organisation he held high office. When, in 1911, he joined the Institute of British Foundrymen he found in it an instrument for the expansion of many of his interests. He, in association with Major Gordon, Captain Hayes and Mr. H. O. Slater, prepared a complete course for apprenticeship training, which undoubtedly bore fruit in the London area. He became president of the London Branch and for many years served on the General Council. Because he made the maximum contribution to the technological welfare of the industry of which an essentially practical foundryman is capable, he was an early choice as a recipient of the Oliver Stubbs Gold Medal, the award being bestowed upon him in 1926. The members of the London Branch will experience a feeling of deep personal loss, and at the first appropriate time will join with us in sending to Mrs. Bartlett and the family their very deep and sincere sympathy.

Contract Open

Birmingham, November 7—Supply and erection of compressed-air pipework, for the Electricity Supply Committee. Mr. F. Forrest, chief engineer, 14, Dale End, Birmingham. (Fee £2, returnable.)

Personal

MR. PERCY HOPKINSON has been elected a director of British Furnaces, Limited, Chesterfield. He has been manager of the company since its inception.

MR. J. A. MILNE has been appointed managing director of J. Samuel White & Company, Limited, Cowes. He joined the firm in February last, when he was appointed general manager.

DR. H. W. GILLETT, chief technical advisor, Battelle Memorial Institute, Columbus, Ohio, has accepted the invitation of the Institute of British Foundrymen to present the fifth Edward Williams lecture at its next annual conference.

MR. JOHN FARR, a foundryman, was awarded the Empire Gallantry Medal (Civil Division) on July 26, 1940, for his display of exceptional bravery and devotion to duty when an explosion occurred in the factory in which he was employed. He was decorated by H.M. the King.

MR. J. RAMSAY GEBBIE has been appointed managing director of William Doxford & Sons, Limited, shipbuilding and marine engineers, Sunderland, in succession to the late Mr. Robert Haswell. Mr. Gebbie joined the firm in 1930 as shipyard manager and was elected to the board seven years later.

SIR SAMUEL OSBORN, president of the Sheffield Engineering Trades Employers' Association, has been elected chairman of the Applied Science Committee of Sheffield University, in succession to the late Dr. Joseph Ward. Mr. P. B. Brown, who was elected vice-chairman, is chairman of Hadfields, Limited.

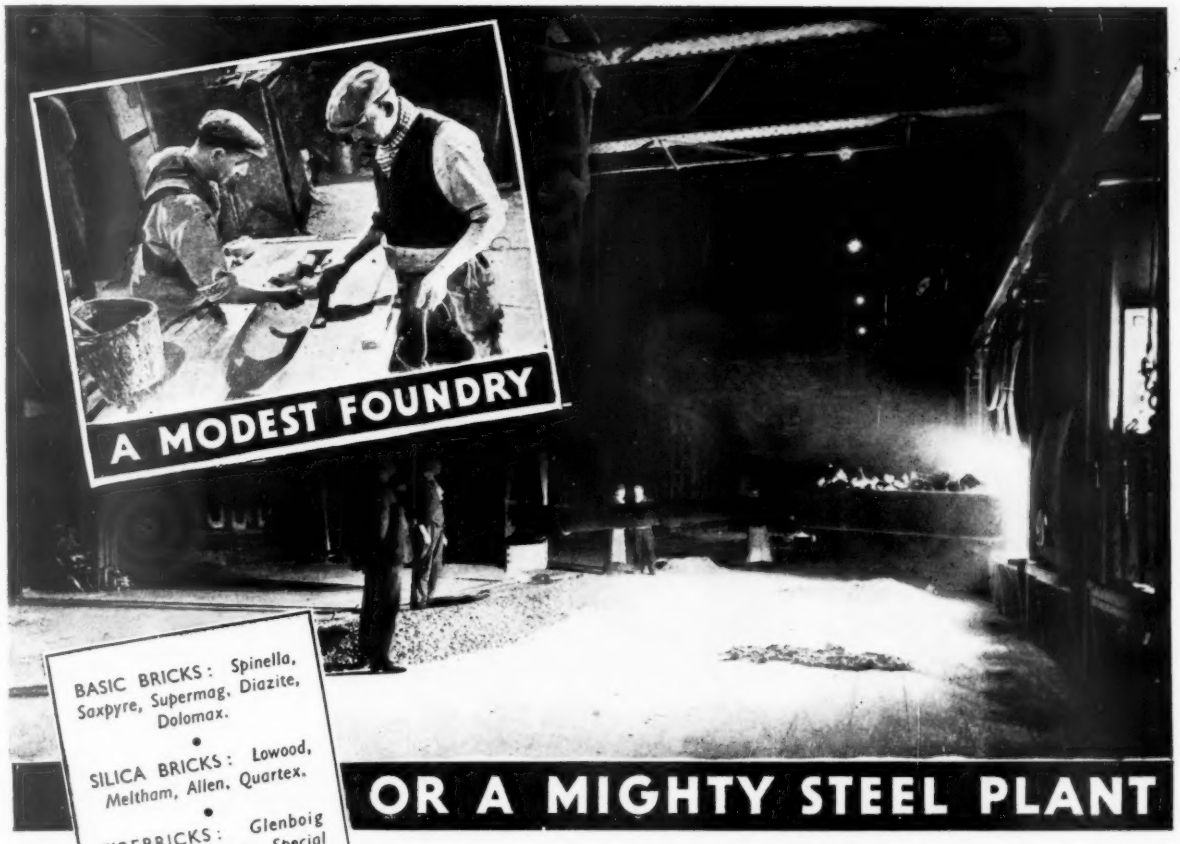
MR. R. E. COWELL, past-president of the Cleveland Institution of Engineers, who relinquished the chair to take over the secretarial duties some years ago, has found himself compelled, through failing health, to resign the post. His successor is Mr. F. G. E. Webster, of Normanby, an official at the Cleveland Works of Dorman, Long & Company, Limited.

Wills

RUSSELL, LUTHER, of Littleover, Derby, iron-founder	£46,296
BROWN, JESSE, of Derby, managing director of Browns Foundry Company, Limited	£9,484
PRIMROSE, A. G., of Glasgow, chairman of Dickson & Mann, Limited, colliery engineers and steel founders, Armadale	£9,914
ELPHINSTONE, SIR GEORGE K. B., chairman of Elliott Bros. (London), Limited, electrical and mechanical engineers	£29,727
HACKETT, EDWARD, founder of Hackett Bros. (1934), Limited, bolt and nut manufacturers, of Halesowen	£17,727
DRUMMOND, LT.-COMMANDER G. H., V.C., R.N.V.R., late of Imperial Chemical Industries, Limited	£1,95
ROSS, CHARLES, of Charles Ross, Limited, structural engineers, Heeley Bridge Engineering Works, Sheffield	£28,57
SMITH, SIR CHARLES HERBERT, chairman of Smith's Stamping Works (Coventry), Limited, James Booth & Company (1915), Limited, and a director of a number of other companies	£152,282

Lighting in Factories

MR. W. J. JONES, in his Presidential Address to the Illuminating Engineering Society, forecast that the future will see 40, 50 or even 100 ft.-candles being commonly utilised for factory lighting. He also pointed out that the Illuminating Engineering Society has played a leading part in assisting the Ministry of Home Security on lighting problems associated with civil defence. A joint committee under the chairmanship of Mr. Percy Good has examined and reported upon a very large number of such problems; and 24 sub-committees have been at work using the services of some 100 members of the Society. They have studied the behaviour of the eyes at very weak illumination, devised new measuring apparatus, checking illumination equivalent to weak star light, have designed new fittings, signs, etc., for use in these dim conditions. The researches of the Society into the visibility of objects viewed from above are being continued and the Committee would be prepared with suggestions for the alleviation of the black-out, when the time is considered ripe by the authorities. In conclusion, Mr. Jones paid high tribute to the workers in factories everywhere, adding that when the lighting industry of this country is free to tell of its efforts during wartime, it will be found that its record of achievement is second to none.



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SILICA BRICKS: Lowood, Meltham, Allen, Quartex.

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FIREBRICKS: Glenboig Special, Glenboig Special Crown, Glenboig, Glenboig Crown, Castlecary, Dykehead, Gem, White Carr, Stour, Hycone.

Alumantine, Hysilyn, Adamantine, Llangennech.

•

CEMENTS: Sintex, Durax, Pyrolyte.

•

INSULATION: Amberlite Bricks, Cement & Concrete.

•

SANDS: Moulding, Brick Facing, Silica, Glass.

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PLASTICS: Durax, Rotaline, Plastic K-N, Glendoline Ground Ganister.

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SILLIMANITE: Tank Blocks, Bricks and Cements.

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ACID-PROOF REFRACTORIES: Obsidianite, Losol.

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BETWEEN users who exercise meticulous care and foresight in the selection of refractories and those who buy 'cheaply' regardless of quality—there are large numbers who acknowledge the value of a suitable refractory for their business, but lack the specialised knowledge, equipment and staff to compare refractory values. To them the General Refractories organisation has much to offer. For example, the "G.R." range of products will provide maximum service and efficiency for any stated purpose—"G.R." laboratories and staff are qualified to understand the problems of a user, to recommend the correct product and supply sound reasons for its selection. Thus users are assured of impartial and helpful service in selecting refractories. The continually increasing number of firms who make use of the "G.R." Technical Advisory Service is significant of the growing importance placed by users on the sound selection of refractories. With the changes imposed by war-time supplies of raw materials and production conditions, the vast resources of General Refractories are a definite assurance to users of maximum value-for-money.

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Raw Material Markets

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Pig-Iron

MIDDLESBROUGH—The supply of common foundry iron from the Northamptonshire and Derbyshire furnaces is regular and the tonnages forthcoming are quite sufficient to meet the needs of consumers on the North-East Coast. Many of the light foundries are able to accept much more business than is coming their way at the present time, but the position is vastly different among the heavy engineering works, which are fully committed over a considerable period ahead. The latter are not getting all the hematite they ask for, but the situation is relieved by the satisfactory quantities of high-phosphorus and refined irons which are being delivered. Production of refined qualities has been expanded of late to meet the growing demand. Economy in the use of hematite is being urged all round, the steelworks also exercising more care in its use. Consequently, rather larger tonnages are now available, but there has been no relaxation in the conditions governing distribution. Any surplus material is being put into stock, the value of which may be enhanced during the winter months. Output of Cleveland foundry iron is still curtailed and local ironworks are occupied to the extent of their capacity on the manufacture of material for the steel industry.

LANCASHIRE—Business in ordinary foundry grades of pig-iron has been rather quiet recently, which is not surprising in view of the dull conditions obtaining at the majority of light-castings and jobbing establishments in this area. Demand for light castings has been poor for months past and it is unlikely that there will be any material improvement until after the war. Certain of the jobbing foundries associated with the machine-tool works are much better placed for business than are the other concerns. Heavy electrical engineers and machine-tool makers are absorbing large tonnages of special qualities of iron and, on the whole, deliveries are coming through fairly steadily.

MIDLANDS—Heavy engineers' plants continue to be called upon to supply large quantities of heavy castings, a big proportion of which is taken up by the machine-tool industry. The volume of low-phosphorus iron and hematite available is not really sufficient to satisfy all requirements, but difficulties are being surmounted by the use of high-phosphorus and refined irons and scrap. The position of the light-castings trade does not show any change, most of the works being compelled to operate well below capacity. Ample supplies of iron are licensed to this trade and many consumers have taken the opportunity to lay down substantial reserves, while some have now suspended further deliveries for the time being. It is difficult to foresee any material change in conditions until after the war, as the trade is dependent almost solely on peacetime outlets and most of these have been cut off by the desire to conserve materials and labour resources.

SCOTLAND—Larger deliveries of pig-iron would be appreciated in this area, but it cannot be said that there has been any hold-up in production due to lack of material. Unfortunately, it has not been possible for stocks of any size to be accumulated and, in fact, few concerns have reserves at all. Local makers of pig-iron are operating to capacity, but it is necessary for their outputs to be supplemented by imports. Basic iron is being despatched to the steelworks in large tonnages, but the volume of hematite coming forward is inadequate, especially in view of the close proximity of winter. Light-castings makers' raw material requirements are easily covered and activity in this section is much below the average level, with the exception of a few firms which have adapted their plant to cope with Government contracts.

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Metals

COPPER—War requirements of this metal have been expanding for a long time past, additional Government factories making a big difference to copper consumption. Now, with the assistance which is being given to our Russian Ally, still larger supplies will be required, for Lord Beaverbrook has intimated that, in addition to tin, zinc, lead and other metals, copper was among the commodities asked for by the Soviet Union, and which we have agreed to supply. As stated in our last issue, severe restrictions on the use of copper in the United States have been announced; these have, of course, been rendered necessary by the heavy demands for the metal from works operating on the defence programme. Strenuous efforts are being made in America to raise the output of copper, and it is possible that an extension of the Government subsidy will be made to incorporate larger numbers of high-cost producers.

TIN—There has been a fair turnover in tin in London during the past few days, offerings of cash metal being taken up at steady prices. Russian interest in tin is maintained, and Soviet purchases to date amount to a substantial tonnage. Quiet conditions have been evident in the United States.

The annual report of the Council of the Tin Producers' Association states that the value of the international restriction agreement has been proved in war, and it is believed that its value to the industry will be proved to be even greater when the problems and difficulties of the peace have to be solved. With the greatly stimulated rate of industrial activity in the U.S.A., record tonnages of tin have been absorbed, but the fear of a possible interruption to supplies has persisted, and serious study has been given to the use of substitutes. The Office of Production Management at Washington called for a report from a representative committee of scientific and industrial experts, and the Tin Research Institute's close contact with members of that committee has assisted in the formulation of a well-balanced statement of the problems involved. So long as supplies of tin continue to be available, no important substitution will occur. Any change will involve the use of less economic materials and processes and will entail considerable study and capital expenditure, and at present the trend is rather to increase the use of tin to replace other metals now in short supply.

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SPELTER—Sufficient quantities of spelter to meet essential requirements seem to be forthcoming, but there is no metal to spare for ordinary civil purposes, and the Control are watching the position carefully. Brass scrap is being used more freely among manufacturers, and the virgin metal thus released will be quickly brought into use.

LEAD—Supplies of lead are still comparatively easy to secure, and pressure of demand does not show any sign of expanding. The chief call continues to come from the cable and battery industries, which are well employed on Government contracts. It is not known what the extent or character of Soviet lead requirements will be, but lead products are likely to be asked for by our Allies rather than supplies of pig-lead.

Conciliation in the Iron Trade

Mr. A. Callighan, general secretary of the National Union of Blast-furnacemen, Ore Miners, Coke Workers and Kindred Trades, emphasises in his bi-annual report to the district delegate boards the value of the principle of conciliation for the settlement of local differences. The acceptance of this principle by both sides, he says, is the reason why the iron trade has been so free from labour disputes. Mr. Callighan reveals that in co-operation with the employers' secretary, an agreement has been reached for the establishment of district joint board machinery covering plants which were formerly outside the scope of their organisation, and he was also able to report progress in relation to the coke-oven section. It has, in fact, been decided to submit an application to the Iron and Steel Trades Employers' Association for the establishment of joint boards to deal with all questions affecting coke-oven plants in respect of which no district joint machinery exists.

Shipbuilding After the War

The need for Government action to prevent a post-war shipbuilding slump was emphasised by Mr. W. A. Woodeson, delivering his presidential address before the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne on October 17. At the end of the war, said Mr. Woodeson, the Government would possess no mean fleet of new cargo ships, and unless the Admiralty and Minister of Shipping took drastic action there would probably be another post-war crisis. Mr. Woodeson described the activities of National Shipbuilders' Security, Limited, in reducing the number of shipyards as a "successful attempt at rationalisation," and added that the Government and other authorities must give the necessary encouragement to ensure a state of adequate output and employment of new tonnage in the future. At the Institution's annual meeting, Mr. Woodeson referred to the all-welded ship. Riveting, he said, was still the chief means of construction in this country, but gradually the saving of weight and material in the welding process was becoming recognised.

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LEAD—Supplies of lead are still comparatively easy to secure, and pressure of demand does not show any sign of expanding. The chief call continues to come from the cable and battery industries, which are well employed on Government contracts. It is not known what the extent or character of Soviet lead requirements will be, but lead products are likely to be asked for by our Allies rather than supplies of pig-lead.

Conciliation in the Iron Trade

Mr. A. Callighan, general secretary of the National Union of Blast-furnacemen, Ore Miners, Coke Workers and Kindred Trades, emphasises in his bi-annual report to the district delegate boards the value of the principle of conciliation for the settlement of local differences. The acceptance of this principle by both sides, he says, is the reason why the iron trade has been so free from labour disputes. Mr. Callighan reveals that in co-operation with the employers' secretary, an agreement has been reached for the establishment of district joint board machinery covering plants which were formerly outside the scope of their organisation, and he was also able to report progress in relation to the coke-oven section. It has, in fact, been decided to submit an application to the Iron and Steel Trades Employers' Association for the establishment of joint boards to deal with all questions affecting coke-oven plants in respect of which no district joint machinery exists.

Shipbuilding After the War

The need for Government action to prevent a post-war shipbuilding slump was emphasised by Mr. W. A. Woodeson, delivering his presidential address before the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne on October 17. At the end of the war, said Mr. Woodeson, the Government would possess no mean fleet of new cargo ships, and unless the Admiralty and Minister of Shipping took drastic action there would probably be another post-war crisis. Mr. Woodeson described the activities of National Shipbuilders' Security, Limited, in reducing the number of shipyards as a "successful attempt at rationalisation," and added that the Government and other authorities must give the necessary encouragement to ensure a state of adequate output and employment of new tonnage in the future. At the Institution's annual meeting, Mr. Woodeson referred to the all-welded ship. Riveting, he said, was still the chief means of construction in this country, but gradually the saving of weight and material in the welding process was becoming recognised.